

In Short

The world of energy is alive and pulsing. From school projects to continental power schemes, here is an overview.

“Green” Production Plant in Berlin for Gas Turbine Components

On May 28, Siemens opened a new 3000-square-meter facility in Berlin to manufacture blades and vanes for the eco-friendly gas turbines the company already produces in its existing plant in that city. On hand to help celebrate this expansion were Siemens CEO Peter Loescher and Germany’s Minister for Economics and Technology, Karl-Theodor zu Guttenberg. The new facility, which adds 200 jobs to the 2,800 Siemens already supports in its

gas turbine operations in Berlin, will produce approximately 14,000 vanes and blades annually. Its energy-saving design has earned the EU’s “Green Building” label. The Berlin plants comprise Siemens Energy’s Competence Center for the production of high-efficiency gas turbines with ratings up to 375 MW. Gas turbines contribute nearly a quarter of Siemens’ total revenue, making Siemens the world’s leading green infrastructure provider.



Karl-Theodor zu Guttenberg (left) and Peter Loescher (center) at the start of the new Berlin production facility.



A Safer Energy Workplace

More secure, more sustainable, and safer – expectations for the energy workplace at construction sites are higher than ever today, reflecting changing attitudes around the world on how business in general is to be done. Environmental, health and safety (EHS) issues concretely reflect one aspect of this change. Customer EHS awareness is continually on the increase, while at the same time a transformation in business cultures is under way. Work safety requires conscientious implementation of EHS issues, processes and regulations, as well

Work safety is also an issue in the energy workplace.

as active support by employees and management alike. Siemens Energy has been very diligent with EHS issues, with many work safety matters having already been addressed and implemented in the organization and additional measures currently in progress. EHS statistics are continuously compiled for all of Siemens’ new-build power plant sites, and the resulting summary is made available for specific regions and areas of activity. For example, the Lost Time Accident Frequency Rate (number of injuries resulting in at least one day of lost time × 100,000 : number of hours worked) for Siemens Energy’s new-build power plants worldwide was 0.19 in 2008.

Wind Turbines for China

Siemens is expanding its global manufacturing network for wind turbines and is building a new production facility in Lingang New City in Shanghai. By establishing this new rotor blade and nacelle plant, the company is further strengthening its environmental portfolio. This new facility is scheduled to take up operation in the second half of 2010, initially with 400 employees. The wind turbines produced in Shanghai will be for the Chinese market and for export. Siemens is investing more than 60 million euro in setting up this new location. “Siemens is expanding its commitment to environmentally friendly energy technology in China with this new wind turbine production facility in Shanghai,” declares Wolfgang Dehen, CEO of the Siemens Energy Sector and member of the managing board of Siemens AG on the occasion of the laying of the cornerstone in Shanghai on May 22, 2009. “China could soon become the largest wind energy market in the world, and with our new production facility in Shanghai we are establishing an excellent starting position for meeting the growing demand of this exciting market. In addition, we are also rigorously advancing the internationalization

of our manufacturing network for wind turbines to optimally meet the needs of our customers in Asia, Europe and America.” The new production site will have a total space of 180,000 square meters and be situated at an excellent location with regard to shipping and traffic facilities, being in the direct vicinity of the Yang Shan deep-sea harbor. Siemens will initially produce blades for 2.3- and 3.6-MW wind turbine plants. These blades will be produced using the IntegralBlade process patented by Siemens, without any glued joints that are susceptible to damage. Wind turbine plant nacelles will also be produced at this new plant. A nacelle is mounted on the top of the tower and supports the rotor as well as encloses a wind turbine plant’s major components for electric power generation; these include the gearbox, the drive train, and the control electronics. The production capacity for the new facility is initially planned at 500 MW annually. The first wind turbine blades and nacelles are scheduled to leave the plant in time for the Expo 2010 international exhibition in Shanghai. Siemens has already reserved additional space in Lingang for potential expansion of this production facility,

Photos: Siemens

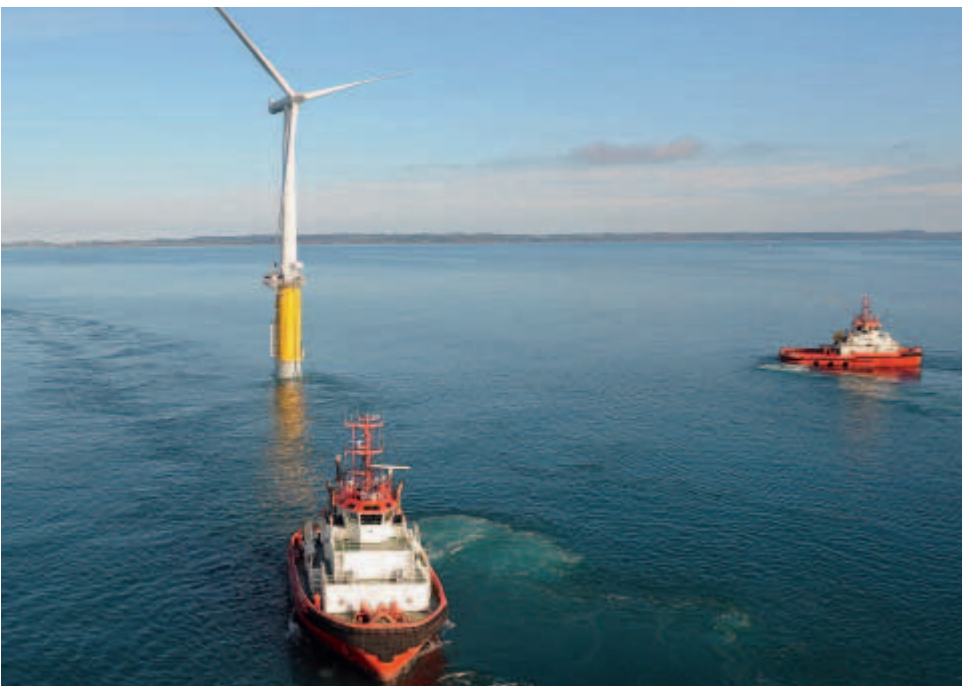


Wolfgang Dehen, CEO Energy Sector and Member of the Managing Board, Siemens AG (center), and Richard Hausmann, CEO of Siemens North East Asia and Siemens Ltd. China (at far left), with customers at the opening ceremonies of the new wind turbine production facility in Shanghai.



The future is bright for wind power technology in China.

however. Since Siemens entered the market for wind turbines through the acquisition of the Danish company Bonus Energy in 2004, it has substantially expanded its worldwide fabrication capacities. Plans for building of a new facility for wind turbine plants in Hutchinson, Kansas (USA), were just recently announced by Siemens. Siemens also recently established rotor blade fabrication facilities in Fort Madison, Iowa (USA), and in Engesvang, Denmark. The Danish locations Brande and Aalborg have additionally been expanded, and new research and development centers have also been set up in Germany, Holland, the UK, the USA and Denmark. The number of Siemens employees involved in the wind energy business has grown from 800 in 2004 to currently over 5,500. This corresponds to an increase of over 680 percent. Wind turbine plants are an important component of the Siemens environmental portfolio, which earned the company revenues of nearly 19 billion euro in fiscal 2008, roughly a quarter of Siemens’ total revenues.



Hywind: offshore wind power production.

Hywind: Installation of First Floating Wind Turbine

Siemens and StatoilHydro have installed the world's first floating wind turbine. The turbine is located approximately 12 kilometers southeast of Karmøy in Norway at a water depth of about 220 meters. The Hywind project was developed by StatoilHydro, and Siemens supplied the SWT-2.3-MW wind turbine with a rotor diameter of 82 meters. Over the next two years the floating wind turbine will be tested to provide a thorough analysis of this innovative concept. Hywind is designed to be suitable for installation in water depths between 120 and 700 meters, which could open up many new possibilities for offshore wind turbine technology. Existing offshore turbines are mounted firmly on the seabed. However, foundations become very expensive at water depths of more than 30–50 meters.

This can limit the large-scale exploitation of offshore wind power particularly in countries with little or now shallow water areas near the coastline. The wind turbine supplied by Siemens is a SWT-2.3-82 with a 65-meter hub height. StatoilHydro is responsible for the floating structure, which consists of a steel floater filled with ballast. This floating element extends 100 meters beneath the surface and is fastened to the seabed by three anchor wires. StatoilHydro and Siemens have jointly developed a special control system for the Hywind turbine to address the special operating conditions of a floating structure. In particular, the advanced control system takes advantage of the turbine's ability to dampen out part of the wave-induced motions of the floating system.

New Wind Turbine Production Facility for Kansas

Siemens will be building a new production facility for wind turbines in Hutchinson, Kansas. When the plant goes into operation, the strong and increasing demand for wind turbine equipment in North and South America will be more effectively met. The 300,000-square-foot Hutchinson facility will produce nacelles, to be used in the company's reliable 2.3-MW wind turbine product family. Initially, the factory's planned annual output will be approximately 650 nacelles – or 1,500 MW.

The USA have been identified as one of the world's fastest-growing wind energy markets. Combined with the recently opened rotor blade manufacturing facility in Fort Madison, Iowa, Siemens is significantly strengthening its US presence and increasing proximity to its customers there. These expansions fit very well with political developments under the Obama administration. In addition to long-term plans for clean energy production, there are immediate steps for the introduction of environmentally friendly technologies, the expansion of the power grid, multiyear production tax credits, and regulations to reduce CO₂ emissions. With President Obama's campaign promises of investing 150 billion dollars over the next ten years in the development of clean energy sources, the prospects for success for the new wind turbine facilities are very promising indeed.

E-Mobility Roadshow Kickoff in Berlin

At a kickoff event on July 15 in Berlin, Siemens Energy and RWE announced their cooperation in electric vehicle technology. Siemens is not only participating in the E-Mobility Roadshow but is also a partner in implementing the infrastructure for electric cars. As a mobile electric storage system, "Filling up" an electric car.



electric cars can be both charged as well as discharged. It can thus serve as an intermediate storage device for electric power from fluctuating generation sources like wind and solar. Equipped with modern control systems, electric cars become an integral mobile component of a stable power grid and sustainable power supply. Since the batteries in electric cars can be charged at varying times, renewable energy subject to daily and seasonal fluctuation can be better exploited. This results in a more flexible and environmentally compatible entire energy system. In addition, electric cars use energy resources much more efficiently than combustion engines. Over the course of the cooperation with RWE, Siemens will install 40

charging spots for electric vehicles at various locations in Germany. The focus will be on Berlin with 20 charging spots. The experience obtained here will be integrated in the implementation of a larger infrastructure for charging spots. Siemens is already active in e-mobility with its Corporate Technology department as well as in the Energy and Industry sectors. E-mobility presents special requirements for the electric vehicles as well as the design of the power grid infrastructure. Areas of research include electric power generation and distribution, traffic and energy management, intelligent electric meters, power electronics, software and sensors as well as the electric motors and recovery and storage of energy.

The Most Influential Woman in Power

At this year's 2nd annual Africa Energy Awards, held in Johannesburg, South Africa, earlier this year, Siemens' Ute Menikheim was recognized with the "Most Influential Woman in Power" award. The award was created to honor a woman who is an acknowledged leader in the industry, who has a vision for the power industry and is striving to attain that goal, who faces the challenges of the energy head on, and who believes in the empowerment of women in the Africa power sector. Ute Menikheim is truly the embodiment of these characteristics. During her four-year assignment as Divisional Director of Instrumentation and Control for Siemens in South Africa, she and her team not only emphasized uncompromising quality and value for their customers, but also advocated

the mentorship and on-the-job training of many local citizens. "We did this not only to promote a healthy future for the energy industry in Africa, but also to make a difference in the lives of the people there," says Menikheim. "I had a brilliant team in South Africa, and this award belongs to them, too. Step by step, we made an impact on that country." Menikheim believes that the power industry is "the most invigorating sector – it plays a vital role in stimulating the economy and contributing to an improved quality of life." The empowerment of women – providing employment opportunities for them beyond traditional menial work – was, and still is, especially close to Menikheim's heart. "Women have the ability to make a difference, and

I want to be an inspiration to all women to show what can be achieved through creativity and hard work."



Ute Menikheim with her award.

Photos: Siemens



Desertec: an ambitious plan for clean power on a continental scale.

Clean Power from Africa

Together with other industry leaders, Siemens Energy is participating in the Desertec initiative to provide sustainable power based on renewables to Europe, the Middle East and North Africa. A corresponding memorandum of understanding was signed for environmentally friendly power generation using solar thermal power plants in the Sahara and wind farms in North Africa. The power generated is to be transported to the load centers where it is needed. A technical and financial concept is being developed. The potential is enormous. The earth's desert regions receive more energy in a mere six hours than the total global consumption in an entire year. In the Sahara, the sun shines 4,800 hours per year (roughly three times more than in Germany) and provides the potential for clean solar power. Solar thermal power plants covering an area of 300 by 300 kilometers could meet worldwide energy needs. Countries such as Morocco or Egypt also offer excellent potential for developing wind power. The Desertec initiative aims to meet 15 to 20 percent of the European power demand using solar- and wind-based electricity by 2050.

Wind Power Facility Buildings Opened by Danish Prince Consort

With all of the pomp and splendor of a royal visit, the new buildings at the Siemens wind power plant facility in Brande, Denmark, were opened on June 4 by his Royal Highness Prince Henrik, the Prince Consort. Amid festivities marked by flags and high spirits, the distinguished visitor was present to inaugurate the new office and canteen buildings. Prince Henrik was welcomed by Andreas Nauen, CEO of Siemens Wind Power, Kai-Eberhard Lueg, CFO of Siemens Wind Power, and employees of the Brande facility. The visit represented extensive preparations on the part of many Siemens employees, with nothing left to chance. During a brief tour of the production facility, the eminent guest was shown the inside of a wind turbine nacelle. While touring the new canteen, Prince Henrik was clearly moved to see more than 500 employees waving flags and giving him a standing ovation. The flags of many of the 53 nations represented by the workforce at the headquarters in Brande were flown during the festivities, demonstrating the tremendous cultural diversity within Siemens Wind Power. When the red ribbon was cut to mark the opening there was a drum solo and a cheer from the employees.

At front from left: CFO of Siemens Wind Power Kai-Eberhard Lueg, His Royal Highness Prince Henrik, the Prince Consort, and CEO of Siemens Wind Power Andreas Nauen at the opening of the new wind power plant buildings in Brande, Denmark.



Best in Test

In April 2008, Siemens Energy opened one of the world's biggest test centers for large compressor trains for use in the oil and gas industry. At a cost of around 100 million euro, the Mega Test Center in Duisburg, Germany (see photo, left) is currently Siemens' largest single investment in Europe. "The test center strengthens Siemens' position as one of the leading suppliers on the growing oil and gas market," says Tom Blades, CEO of the Siemens Oil & Gas Division. The first year of operation saw comprehensive testing successfully completed on no fewer than 25 compressor trains. These trains, comprising the complete steam and electric drive systems, massive multistage compressors and all ancillaries can be as large as a good-sized house, weigh in at many hundreds of tons and consume enough energy to power a small town.

Advanced High-Voltage Power Line at Frankfurt Airport

On June 15, RWE Transportnetz Strom GmbH, based in Dortmund, Germany, gave the go-ahead for the installation of a gas-insulated, extra-high-voltage transmission line (GIL) at Frankfurt Airport. Siemens Energy is replacing a 1-kilometer-long high-voltage overhead line with a buried, gas-insulated extra-high-voltage transmission line. Two GIL systems, with a transmission capacity of about 1,800 MVA each, will connect a 380-kV transformer substation in the northwest of the airport that has already been constructed using Siemens' compact gas-insulated switchgear.

Siemens Broadens Environmental Portfolio

Siemens Energy has acquired the majority of Steinmüller Engineering GmbH (Gummersbach, Germany), a provider of engineering for innovative CO₂- and NO_x-reducing combustion technologies and exhaust-gas cleaning systems for fossil fuel power plants. Steinmüller has a workforce of more than 60. Already well established in the US marketplace with its Environmental Systems and Service business, Siemens Energy is now expanding its environmental presence to Europe. The company will retain the name Steinmüller Engineering GmbH and continue to operate from its Gummersbach location.

Photos: Siemens

Study Project Winners from Singapore Visit Germany

Winners of the 2009 National Weather Study Project (NWSP) in Singapore earned a trip to Germany in July. NWSP was founded by Senoko Power, a leading Siemens customer in Singapore. Siemens Energy Sector Singapore cosponsors the annual competition, which aims to increase awareness among students about the impact of climate change on the environment. Participants prepare projects that demonstrate how this problem could be dealt with now and in the future. This year, the popular event attracted 235 teams from 152 schools in Singapore. Winning projects were chosen in primary school, high school and college level categories.

Singapore students touring Germany.



Transformer with Biopetroleum

Usually, when we think of rapeseed oil, it is in the context of salad dressing or low-cholesterol cooking. Siemens, however, has developed a hermetically sealed power transformer with the



Not just a pretty face. Rapeseed oil is now being used in advanced electric transformers.

insulation fluid based on rapeseed oil. This innovative development is especially interesting for customers who not only place a value on the environmentally friendly production of power, but on its transmission as well. Modern power transformers are increasingly confronted by two challenges. First, they are designed to require low maintenance, and second, they need to be environmentally friendly. These two qualities have been combined in a new power transformer produced by the Siemens transformer factory in Dresden, Germany. The new device is filled with a rapeseed oil-based ester fluid as its insulator and is hermetically sealed. Biodegradable materials are becoming increasingly important for energy providers. However, this must not come at the cost of performance, resilience or durability. In the case of the rapeseed oil-based ester em-

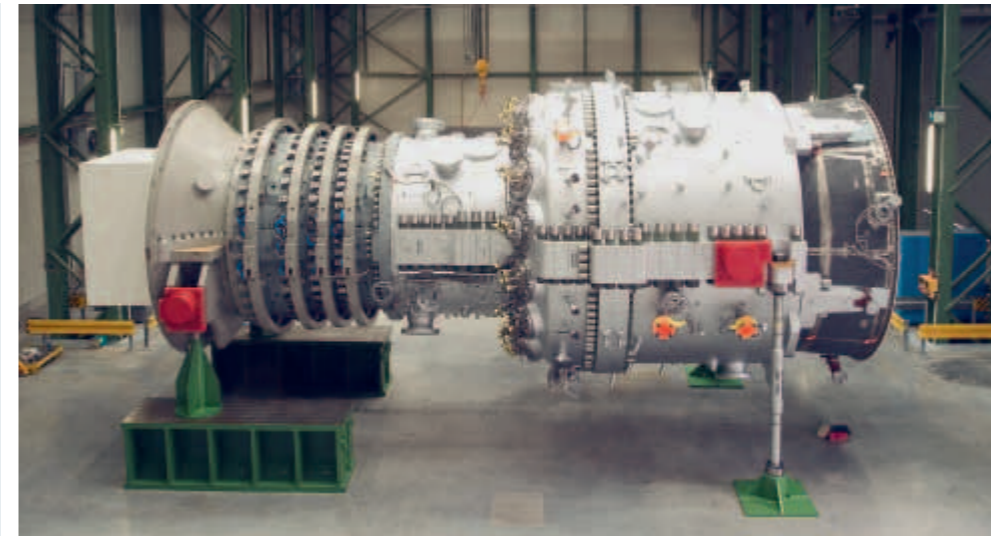
ployed by Siemens, the insulator fluid provides combustion resistance superior to the mineral oils used in conventional devices. In addition, the fluid is completely biodegradable, with no danger of water contamination. The fluid demonstrates slower cellulose aging in comparison to mineral oil. Which means longer lifetime for the transformer. The device can also be used in areas where fire protection is technically difficult and can be operated in areas with strict environmental controls. In addition to the advantages of the rapeseed oil insulator, the hermetic encapsulation provides additional performance, security and construction advantages. Currently, the new transformer is in operation in Teinach in the Black Forrest. The goal is to optimize the transformer on the basis of the knowledge gained here, especially with a view toward broader commercial use.

Innovator Coauthors Definitive Book for Combined-Cycle Power Plants

Within the complex field of combined-cycle steam and turbine power generation technology, one book has stood apart as the standard reference: *Combined-Cycle Gas & Steam Turbine Power Plants*, edited by Rolf Kehlhofer et al., has played a defining role and influenced a generation of students, engineers and developers. For the third edition of this milestone work, renowned Siemens innovator Dr. Bert Rukes and his team have added their expertise in expanding and revising the book. Their contribution was to provide all of the content for a number of chapters as well as collabo-

rating on most of the others. Rukes, whose distinguished career has seen him being recognized with the prestigious Siemens Top Innovator Prize for outstanding innovations in fossil fuel power plant solutions, is proud to have been a part of the project. He is especially satisfied that Siemens technology is now being featured in this reference that will have an important influence on the next generation of students and engineers. Rukes notes that during his many years in the industry, this was the only book that continually found itself in his hands when he looked for a

reference guide. *Combined-Cycle Gas & Steam Turbine Power Plants* is unique in that it doesn't just provide a description of a specific power plant, but examines the underlying physical principles as well. This equips the reader with the tools to design a power plant. The book targets a global audience, and its intended readership consists of both students and engineers.



Siemens Awarded the Steel Innovation Prize for New Turbine

For its innovative gas turbine type SGT5-8000H, Siemens Energy was awarded the special "Climate Protection with Steel" category of the Steel Innovation Prize. The award-winning turbine has a total weight of 440 tons and consists of about 95 percent steel. Despite its imposing size and strength, the machine is not just brute heavy metal, but a remarkable example of high technology that brings an important contribution to global climate protection. When combined with a steam turbine, the new gas turbine will set a new world record for efficiency for combined-cycle power plants. The increased efficiency saves fuel, protects resources, and reduces CO₂ emissions. The reduction in CO₂ emissions is the equivalent of 10,000 mid-sized cars driving 20,000 kilometers per year.

The Steel Innovation Prize is awarded every three years by the Steel Information Center of the German steel industry. The new Siemens turbine uniquely combines conventional heavy-machine construction



Siemens Energy was recently awarded the Steel Innovation Prize for its powerful, yet efficient and environmentally friendly SGT5-8000H gas turbine (shown above).



methods with ultramodern manufacturing technology. The turbine consists of more than 7,000 individual parts ranging in size from minute to mammoth. On its own, the SGT5-8000H can generate 375 MW of electrical power. When combined with a steam turbine, this is increased to over 570 MW, enough to power a city of 3 million people, such as Berlin. In addition to the Steel Innovation Prize, Siemens' operational SGT5-8000H power plant Irsching 4 near Ingolstadt has been recognized as a specially designated area by the "Germany, Land of Ideas" initiative under the auspices of German president Horst Koehler.

Most Flexible and Environmentally Friendly Combined-Cycle Power Plant for Rotterdam

Siemens Energy is currently constructing one of Europe's most environmentally friendly fossil-fired power plants in the Netherlands. The state-of-the-art combined-cycle gas turbine (CCGT) power plant, which will be located in the Europoort area of Rotterdam Harbor, was ordered by Enecogen, a partnership of the Dutch Eneco and Danish DONG Energy utilities. The 700-million-euro project, which includes a long-term service contract, is scheduled to go on line in late 2011 with an output of about 870 MW.

Thanks to their modular design, plants of this type offer more adaptability to specific customer and site requirements. With NO_x emissions of less than 10 ppm and a plant efficiency of more than 59 percent, the Enecogen project will be one of Europe's most efficient fossil fuel power plants in its class. Due to the very competitive and flexible project offering, Siemens Energy Solutions had been chosen as turnkey supplier. In addition to the main components – gas turbine, steam turbine and generator – Siemens will also supply the entire electrical and I&C systems and handle long-term plant maintenance. The Enecogen partners see the use of high-efficient and flexible gas-fired power plants and gas storage as a means to balance the more volatile wind power production.



Signing ceremony for the new CCGT project.

Photos: M. Ruckszio/Naturbildportal, Siemens